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EXAMINER

MAPLES, JOHN S

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. (New Rejection)

In claim 1, lines 4-6, the expression "thin film undergoes an increase in porosity that advances inside from the thin film surface during charge and discharge" does not find support in the originally filed specification.

Claims 2-22, dependent on claim 1, fall therewith.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (New Rejection)

It is unclear what is meant by the terminology "advances inside from the thin film surface during charge and discharge" found in lines 5-6 of claim 1? It is not known what

this expression means or encompasses. For example, where does the porosity advance to and to what element(s) does the word "advance" make reference to?

Clarification and amendment of claim 1 is required.

Claims 2-22, dependent on claim 1, fall therewith.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-5, 8-10, 12-17 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP-2003-007295 ('295-corresponds to JP-02/071512) in view

of Ikeda et al.-EP 1231651 (Ikeda) and further in view of either Ebner et al.-US 4,853,304 (Ebner) or JP-07-249431. ('431)

Reference is made to paragraphs 30 and 44-51 of '295 for a noncrystalline (amorphorous) silicon thin film with cobalt therein for use as an anode in a non-aqueous battery, which electrolyte includes the claimed vinylene carbonate and diethyl carbonate and the recited salts. Paragraph 44 in '295 also recites esters for the electrolyte and one ester compound cited is gamma-butyrolactone. It is noted that paragraphs 33-34 in '295 disclose roughening the current collector. The only claimed features not shown by '295 are the carbon dioxide in the electrolyte, the specific roughness of the current collector and the columns in the thin film. As set forth in the Abstract, column 2, lines 15-23 and column 4, lines 26-43 of Ebner and as set forth in the English language Abstract of '431, the amount claimed of carbon dioxide is added to a non-aqueous battery. It is noted that Ebner is used in particular in organic electrolytes that include ester solvents-see column 2, lines 10-23 therein. It therefore would have been obvious to one of ordinary skill in this art at the time the invention was made to have the battery of '295 include the claimed amounts of carbon dioxide as taught by both Ebner or '431 because the same would improve the cycling efficiency of the non-aqueous battery. It is noted that Ikeda teaches in paragraph 12 roughening the current collector therein to a size of 0.1 microns. It would also have been obvious to make the roughness of the current collector in '295 of 0.1 microns as taught by Ikeda because the same would allow for better adhesion of the active material on the electrode. In addition, Ikeda discloses in the Abstract and in at least paragraphs 6-21, an amorphous silicon thin film

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in a lithium battery where the film is divided into columns by gaps that extend in the thickness direction of the film. To have included the columns in the thin film of Ikeda in the thin film of the anode in '295 would have been obvious to improve the output of the lithium battery.

Applicant's arguments have all been considered but are not deemed persuasive. Applicant argues that it would not have been obvious to one of ordinary skill in this art to have added carbon dioxide to a rechargeable lithium battery including an anode comprising a noncrystalline thin film composed of silicon on a current collector in view of the above cited references. The examiner respectfully disagrees. As set forth in the previous paragraph, Ebner envisions in column 2, the addition of carbon dioxide to lithium secondary batteries that utilize an organic ester solvent in the electrolyte. This is precisely the organic solvent used in the primary reference '295, and so a prima facie case of obviousness has been established.

Applicant further argues that Ebner and '431 do not use a silicon anode. This may be true, however, the above rejection is sound for the reasons presented in the previous two paragraphs.

A further argument by applicant is that the addition of carbon dioxide in the nonaqueous electrolyte suppresses the increase in porosity and that such effect is not observed in other negative active materials. This may be true, however it would have been obvious to have added carbon dioxide to the nonaqueous battery of '295 for the reasons already presented in this action.

Finally, applicant points to the data presented in the "Reference Experiment" in the present specification. Again, the examiner refutes this argument by the previously presented discussion relating to the applied references and how they together render obvious the claimed subject matter.

8. Claims 1-5, 8-10, 12-15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP-01-029913 ('913) in view of Ikeda et al.-EP 1231651 (Ikeda) and further in view of either Ebner or '431.

Reference is made to page 1, lines 1-32; page 4, lines 20-28; the last 3 lines of page 5 through page 6, line 8 and the last 7 lines on page 7 through line 9 on page 8 of '913 for a noncrystalline (amorphorous) silicon film that may include cobalt or iron therein for use as an anode in a non-aqueous battery, which electrolyte includes the claimed propylene carbonate or ethylene carbonate and dimethyl carbonate and the recited salts. Page 7, the last four lines in '295 recites esters for the electrolyte and one ester compound cited is gamma-butyrolactone. It is noted that Ebner is used in particular in organic electrolytes that include ester solvents-see column 2, lines 10-23 therein. It is noted that lines 5-6 on page 6 in '913 disclose roughening the current collector that includes the claimed 0.1 micron size. The only claimed feature not shown by '913 is the carbon dioxide in the electrolyte and for the thin film including columns. As set forth in the Abstract, column 2, lines 15-23 and column 4, lines 26-43 of Ebner and as set forth in the English language Abstract of '431 the claimed amount of carbon dioxide is added to a non-aqueous battery. It therefore would have been obvious to one

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of ordinary skill in this art at the time the invention was made to have the battery of '931 include the claimed amounts of carbon dioxide as taught by both Ebner or '431 because the same would improve the cycling efficiency of the non-aqueous battery. Ikeda discloses in the Abstract and in at least paragraphs 6-21, an amorphous silicon thin film in a lithium battery where the film is divided into columns by gaps that extend in the thickness direction of the film. To have included the columns in the thin film of Ikeda in the thin film of the anode in '913 would have been obvious to improve the output of the lithium battery.

Again, applicant's arguments have all been considered but are not deemed persuasive. Applicant argues that it would not have been obvious to one of ordinary skill in this art to have added carbon dioxide to a rechargeable lithium battery including an anode comprising a noncrystalline thin film composed of silicon on a current collector in view of the above cited references. The examiner respectfully disagrees. As set forth in the previous paragraph, Ebner envisions in column 2, the addition of carbon dioxide to lithium secondary batteries that utilize an organic ester solvent in the electrolyte. This is precisely the organic solvent used in the primary reference '913, and so a prima facie case of obviousness has been established.

Applicant further argues that Ebner and '431 do not use a silicon anode. This may be true, however, the above rejection is sound for the reasons presented in the previous two paragraphs.

9. Claims 6, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over either '295 or '913, each taken in view of Ikeda and Eschbach et al.-US 5,681,357. ('357)

The only claimed features not shown by both '295 and '913 is the copper alloy current collector. The '357 patent teaches in column 3, lines 8-24 a copper alloy current for a non-aqueous lithium secondary battery and to include the same in either '295 or '913 would have been obvious because the same provides excellent current conduction for the battery cell and is a straightforward substitution in this art.

Applicant has not specifically argued the above rejection nor the following rejection and so no rebuttal is necessary.

10. Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eber or '913, each taken in view of Ikeda and further in view of JP-2000-311706. ('706)

The only claimed features not shown by Eber or '913 are the specific amounts of the various electrolyte solvents set forth in claims 18-21. The '706 reference teaches the claimed amount of the ethylene carbonate not exceeding 70% because this solvent is part of a three part solvent not less than 30% in volume. The '706 also teaches the vinylene carbonate of not less than 0.5%. It would have been obvious to have the ethylene carbonate of an amount of 0.1-20% or an amount of 50-70% because the same would provide enhanced conductivity of the electrolyte. To include in either Eber

or '913 the amounts of the solvents in '706 would have been obvious for the high conductivity of these solvents.

11. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John S. Maples whose telephone number is 571-272-1287. The examiner can normally be reached on Monday-Friday, 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Michener can be reached on 571-272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John S. Maples/

John S. Maples
Primary Examiner
Art Unit 1795

JSM/3-13-2010